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Forest
Service

**Intermountain
Region**

Ogden, Utah

Cassia Wildlife Habitat

A Method of Evaluation

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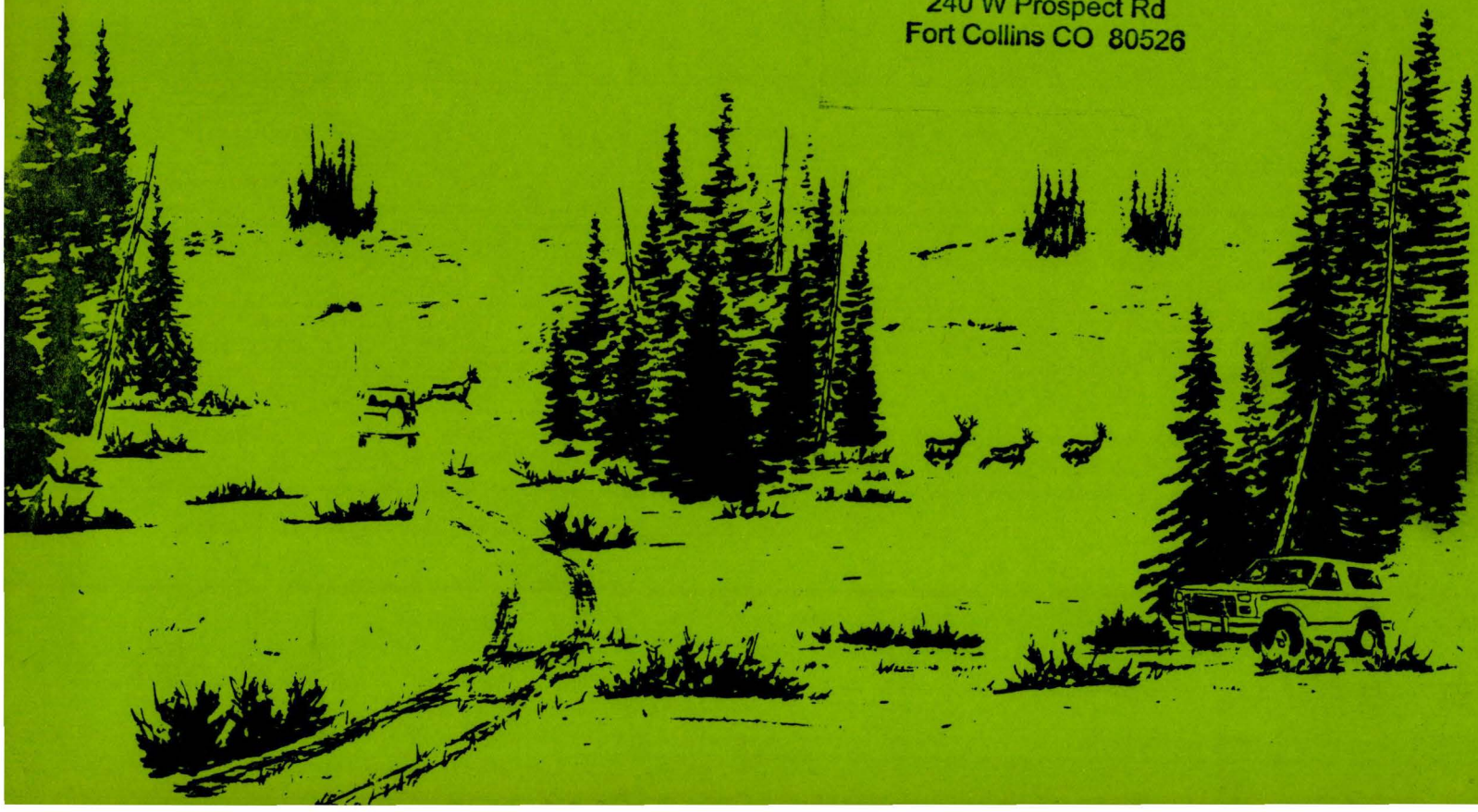

CASSIA

Wildlife Habitat Evaluation

by
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Intermountain Region
Forest Service

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INTRODUCTION

Justification

Within the Cassia Division of the Twin Falls Ranger District, lodgepole pine (Pinus contorta Dougl) dominates the coniferous Forest. Prior to the last two decades, the small size of the mature tree protected it from large-scale harvesting. Because the annual harvest was small, little attention has been given to the lodgepole pine growth patterns and wildlife community relationships within this area. However, with increasing demands for wood products, economic incentives have provided the opportunity to convert large blocks of mature or decadent lodgepole pine stands into younger community types. In response to these management needs, this study was initiated in an attempt to understand the wildlife-habitat relationships on the Cassia Division.

Objectives

The objectives of this study were:

1. To inventory the major vertebrate species within the predominant overstory types of the Cassia Division.

2. To correlate densities or frequencies of major vertebrate species with habitat types, successional community types, and stand structures.

3. To develop the anticipated response of management indicator species to successional community types and stand structures.

4. To propose a method for delineating both the stands and sequence of stand harvest that would improve the successional sequence of wildlife habitat on the Cassia Division.

STUDY AREA

Geographic Location and Physiography

The wildlife evaluation area was centered around the Bostetter Guard Station. This area is located about 20 miles southeast of the city of Twin Falls, Idaho.

The evaluation area (65,120 acres) lies between 6,000 and 7,800 feet in elevation and is comprised of ten land forms. About half of the area is considered to be of volcanic origin, with scattered conifer, mixed conifer-aspen, or pure aspen stands. The majority of the topography is moderately dissected (Table 1).

Overstory

The climax vegetation is described by five major habitat types. About 42 percent of the area is classified as Alpine fir/Osmorhiza habitat type. Alpine fir/Berberis repens is considered the minor habitat type (8%).

Overstory stands are scattered across the evaluation area in an array of shapes, sizes, and species compositions. Of the total 65,120 acres, 24,254 acres are forested with most stands 10 to 15 acres in size. This results in a cover forage ratio of 35:65. Pure stands of aspen (35%) and lodgepole pine (35%) dominate the evaluation area (Table 2). The Alpine fir/lodgepole pine mix is the next most common type and covers 3,329 acres (14%). Minor amounts of chokecherry, ceanothus, mountain mahogany, and willow are also present.

The Alpine fir and lodgepole pine conifer types total 12,584 acres (52%), while 230 stands of mixed aspen and conifer represent an additional 2,417 acres (10%). Throughout the area, conifer stands with some Alpine fir are taller (55 ft.) and have a larger average DBH (9.3"). Aspen stands and stands of mixed conifer and aspen are considerably shorter (35 ft.) and have an average DBH of 6.5 inches. Pure stands of lodgepole pine average 41 feet in height and have an average DBH of 7.7 inches.

METHODS

Field Methods

Sampling plots (0.09 acre) were placed in stands to sample homogenous units of tree and understory vegetation. Selected sites avoided ecotones between obviously different plant community types and areas grazed by domestic livestock.

In general, the plots were oriented with the long axis parallel to existing contours. Plot sides were outlined with stretched tapes. Two additional tapes divided the plot into three macroplots (15 X 83 ft.). Along each boundary tape, 20 microplots (8 X 20 inches) were placed at 1 ft. intervals. Thus, each sampling site consisted of 80 microplots and three macroplots.

Within each macroplot, tree species were tallied by (2 inch) breast-height diameter classes. In addition, all trees were tallied by heights as:

1. Stems (greater than 20 ft.)
2. Saplings (4 ft. to 20 ft.)
3. Seedlings (less than 4 ft.)

Dead trees were tallied separately.

For each understory plant species canopy coverage was recorded in one of six classes:

1. 0-1%
2. 2-5%
3. 6-25%
4. 26-50%
5. 51-75%
6. 76-100%

To estimate standing crop, 10 hoops (1 $ft.^2$) were randomly tossed, the herbage clipped, and the wet weight of each plant species recorded. Wet weights of plant species were converted to total herbage (lbs/acre), as outlined by the

Range Environmental Analysis Handbook (1969). From three site replications at each location, an average standing crop value was calculated.

For each microplot, the following data were recorded:

1. Plant densities by species
2. Number of rabbit pellets
3. Percent overstory

Percent overstory was determined by counting the number of times the overstory obscured the sky on a leveled mirror marked with 100 grid intercepts. The mirror was hand held approximately 1 foot above the ground.

Downed woody material on each reconnaissance plot was measured as outlined by Brown (1974). This planar intersect technique inventories naturally fallen woody material and has the same theoretical basis as line intersect methods (Van Wagner, 1968). To facilitate data collection and economize time, the 35 foot ends of the stretched boundary tapes defined eight sampling planes for each plot.

The small mammals at each site were inventoried with systematic trapping grids, which consisted of five rows and eight columns. Forty Sherman live traps spaced at 50-foot intervals were baited with a mixture of grains and peanut butter. The grid area (1.56 acre) was centered on the stand center point. Captured animals were toe clipped and comparative small mammal densities were estimated on an animal-per-acre basis by means of a mark-recapture estimator.

Bird communities associated with each sampling area were evaluated with cruising surveys throughout the homogenous stand, generally about 5 acres. Evaluation periods lasted 45 minutes and were completed by mid-morning.

DATA ANALYSIS

Plant and Overstory Communities

In order to comply with the recommended silvicultural prescription and harvesting techniques, all stands on the evaluation area were grouped by slope and age classes. A summary of this stratification is found in Tables 3 and 4. Stands with slopes equal to or greater than 41 percent are considered unmanaged. The relationships between the management slope constraints and management age classes are shown in Table 5.

Overstory stands were also analyzed according to the habitat type, community, and structural groups to which they belong.

Diversity Calculations

The following formula (Shannon and Weaver, 1963) was used to calculate biological diversities.

$$H' = -\sum_{i=1}^{s} P_i \log_e P_i$$

This formula is commonly used by avian ecologists because it accounts for:

1. The presence of each species, often referred to as species richness, wherein "s" is the total number of species.
2. The relative abundance of each species (P_i), or the proportionality of each species in the community.

High H' values indicate greater diversity and are obtained in cases where more species are present and/or where the individuals are evenly distributed among the species.

A measure of species evenness (J') was calculated from:

$$J' = \frac{H'}{H'\ max} \quad \text{(Pielou, 1966)}$$

The value of J' varies from 0 to 1, where all species have equal densities. H'_{max} is the $\log_n$ where N is the number of species in the community. Thus, as H'_{max} all species are represented by the same proportion of individuals.

Development of Wildlife Constraints

To integrate the wildlife evaluation and existing timber inventory data into meaningful wildlife management information, stand constraints were developed for management indicator species. Some species such as the mule deer and blue grouse have social or economic importance. Other species such as the brown creeper, goshawk, and hairy woodpecker were thought to have value as indicators of community succession and conditions of stand structure. For these management indicator species, several statistical procedures were used to develop from stand parameters important wildlife constraints. These constraints then became a way to delineate and summarize stands that were important to wildlife species. In addition, some estimation as to the time frame a stand might be considered a prime wildlife habitat could be made. Some of the statistical methods utilized included t-statistics, Analysis of Variance and Principal Component Analysis as outlined by Dixon (1974) in BMD Biomedial Computer Programs.

QWICK QWERY Reports

A QWICK QWERY proprietary report writer was used to facilitate the summary of a large number of stands and stand variables. This automatic data process is outlined in detail by CACI, Inc. QWICK QWERY User's Manual (1975). In general, the QWICK QWERY system allowed input constraints to sort stands on the wildlife evaluation area into groups that were deemed critical to management of wildlife species.

RESULTS AND DISCUSSION

The general format of this section will be to compare the important stand parameters and associated wildlife response to the classification of habitat by habitat type, community type and stand structural groups. Since landforms are not significantly modified by timber harvests, little effort is directed at analysis of wildlife-landform relationships.

In this section, habitat refers to the anticipated climax community. Community type attempts to describe in general terms the species composition of each study site. Stand structural groups stratify study sites into stands with similar tree heights, stems/acre, DBH, and canopy coverage. Habitat types set the base for successional communities. Community types delineate where, in the succession sequence, the stand is and structural groups most closely relate to timber harvest terminology.

Landform and Habitat Types

The hillslope landform described as volcanic, scattered conifer trees, moderately dissected and between 6,000-7,500 feet in elevation was the most common landform classification for study sites (45%). The habitat type ABLA/OSCH was also observed in about the same proportion (42%, Table 1). From Table 1, it is apparent that landforms do not substantially influence the distribution of the major habitat type. For example, one expects about 18 percent of landform 214-2C to be classed as ABLA/OSCH. In this regard, 16 percent of the study plots classified as this landform were listed as ABLA/OSCH habitat type. This condition probably exists because of the broad descriptive terms associated with landforms and the very site specific conditions that made up the habitat type descriptor.

Habitat Type, Community Type, and Structural Group Parameters

The occurrence of habitat types within the community and structural types is not significantly different (Table 6). This trend probably results from the fact that all sites are in some successional stage of an Alpine fir climax community.

Of the major stand parameters , only crown radius, percent overstory, and total stems/plot were significantly different among the habitat type groupings (Table 7). Since these parameters are interrelated, one would expect a relationship of this type to exist. This result is consistent with the finding that the overstory species composition is similar between types. A similar consistency is found in the major stand structures of age, DBH, tree height, and standing dead. It can be concluded from this data that habitat type is not a good predictor of habitat conditions.

Stand conditions associated with community type groups are found in Table 8. Among these groups, a significant difference appears in all stand parameters.

Overstory species composition is also dissimilar with some stands representing mixed overstories and other stands are homogeneous. With this method of site stratification, stands are grouped by species composition and the probable sequence of community succession is suggested in Figure 1.

The relationships between sites grouped by structural types and stand parameters are shown in Table 9. As in the case of community groupings, structural groups have significantly different stand conditions. For example, groups A through E are stands of pure lodgepole pine. These groups are organized by total stems/plot and follow a production gradient from many smaller stems (125/plot) to a few larger stems (21/plot). With this method trends in the DBH, tree height, crown radius, percent overstory and nearest neighbor distance are observed. Groups F through G represent similar trends in stands with mixed overstories. Among these stands (F-G), significant changes in DBH, height, low live limb, crown radius, percent overstory, basal area, and percent standing dead are associated with changes in the ratio of lodgepole pine and Alpine fir or aspen.

Habitat Type, Community Type, and Structural Group vs Herbage Production

Herbage production among the habitat types is presented in Table 10. Significant differences between habitat types were found in percent understory canopy coverage and the amount of forb production. In both parameters, the habitat type ABLA/ARCO had values that were significantly larger. This result is probably a reflection of the aspen type communities that are associated with the Arnica understory. These stands also have less crown canopy which provides for sites more capable of higher herbage production.

The production of herbage in stands grouped by community type was significantly different among groupings (Table 11). Stands representing early succession or aspen dominated communities generally produce more herbage and have higher levels of understory canopy coverage. Other minor trends in understory canopies and herbage production are present; however, the most consistent result is found in lodgepole-pole stands which have the lowest canopy and production values.

Corresponding understory conditions are also found in stands grouped by structural type (Table 12). Again, groups with a mixture of aspen fir and lodgepole are more productive. Older stands of pure lodgepole pine that have decadent canopies also are more productive than the younger stands.

Habitat Type, Community Type, and Structural Groups vs Downed Woody Accumulations

Comparisons of downed woody material accumulations within habitat type groups was not determined to be significant (Table 13).

The accumulation of downed woody material is significantly different between the community types (Table 14). Live woody materials are more abundant (1.05 to 1.27 tons/acre) in stands where aspen is an important overstory species. Downed log accumulations are associated with lodgepole pine-fir stands (10.1 tons/acre), total woody material is significantly higher in the mid-successional stages of logdepole pine (19.8 to 20.3 tons/acre), and lodgepole fir stands (22 tons/acre).

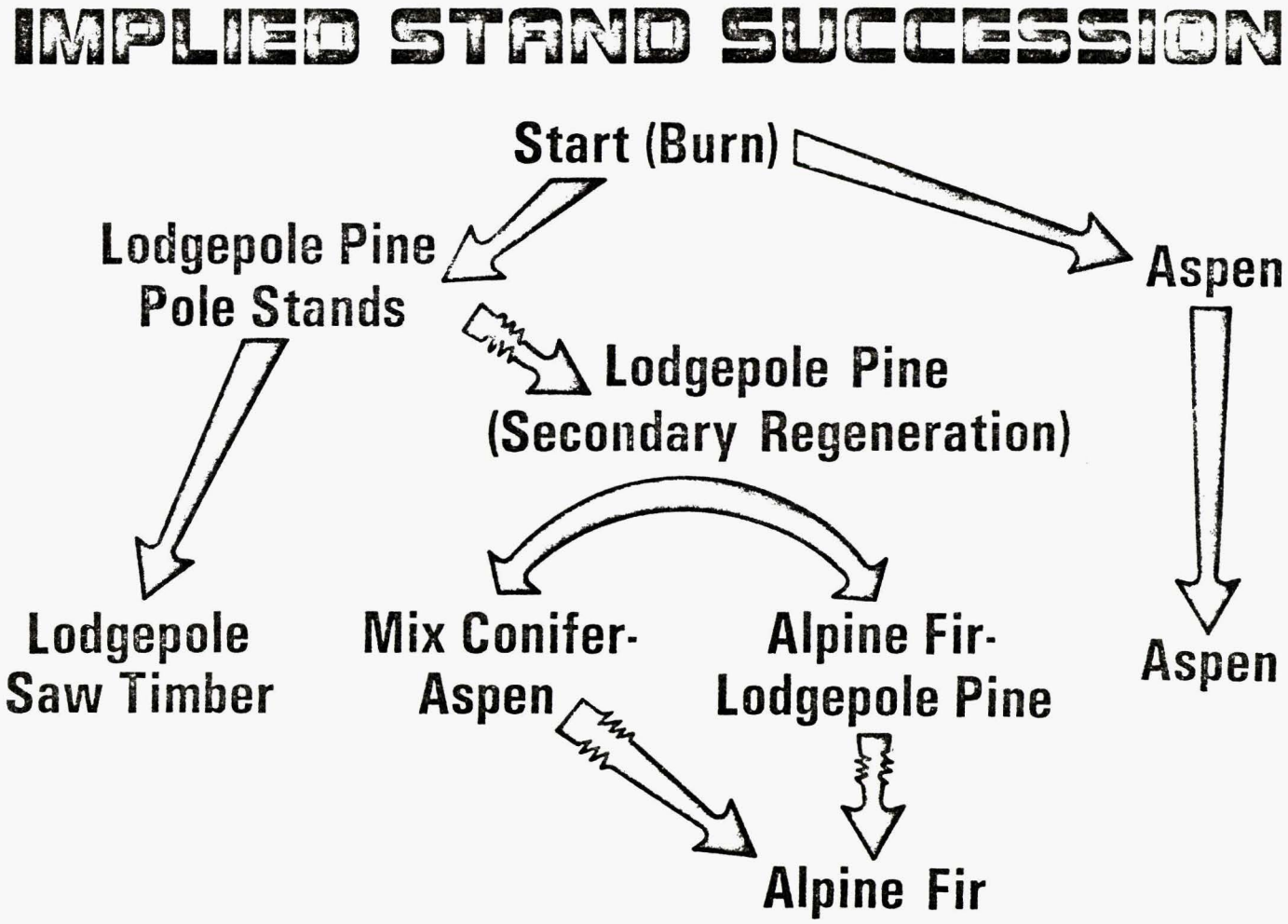

FIGURE 1. The probable sequence of stand succession on the Evaluation Area of the Cassia Division, 1979.

Structural groupings of pure lodgepole pine have smaller amounts of total downed live woody material (.07 to .18 tons/acre (Table 15)). The more mature stands of logdepole pine (11.8 tons/acre) and pure aspen stands (12.5 tons/acre) have smaller accumulations of total downed woody materials. The lodgepole pine-fir stands accumlate the largest levels of downed logs (11.4 tons/acre).

Vertebrate Response to Habitat, Community, and Structural Types

Small mammals and deer

Among the small mammal and deer variables associated with the habitat type groups, only the calculated diversity (H') was found to be significant (Table 16). Small mammal diversity was significantly lower in the Alpine fir/*Carex rossii* (H' = .61) and Alpine fir/*Berberis repens* (H' = .57) habitat types. While the average numbers of small mammals, deer pellet groups, and deer beds are not significantly different between habitat types, the frequency at which they were observed demonstrates some interesting trends (Table 17). For example, *Eutamias* spp. (chipmunk) was trapped on every study site and *Peromyscus maniculatus* (deer mouse) was found on between 62 percent and 98 percent of the sites classified by habitat type. Of the mustelids trapped, the longtail weasel was trapped on three of five habitat types, while the shortail weasel was trapped on all five types. This trend holds true for the *Spermophilus* spp. as the golden-mantled squirrel was trapped on all five habitat types and the Belding ground squirrel was found on two of five habitat types. *Thomomys talpoides* (northern pocket gopher), *Neotoma cinera* (bushytail wood rat), and *Zapus princeps* (western jumping mouse) were trapped in only one habitat type.

These findings imply that grouping stands by the classification of habitat type is not a good predictor of small mammal and deer site response.

Among the sites classified as community or structural types, the higher chipmunk densities are found on sites with mixed canopy types (Tables 18, 19, 20, and 21). These species select community types characterized by an age of 85, DBH of 10.2, low live limb heights near 13 feet and about 17 percent standing dead. The structural groupings of older mixed conifer stands with larger trees support this trend of chipmunk preference.

Microtus species are most abundant in aspen or stands that were recently burned. On other sites, the frequency of microtus trapped/plot varies between 0 and 30 percent.

Deer mice were commonly trapped on all community and structural types. The highest densities of these species are associated with younger lodgepole pine or stands where aspen is important in the overstory.

The golden-mantled squirrel is the most common ground squirrel. Its densities are highest in stands with decadent canopies or those in the earliest stages of succession growth. Belding ground squirrels are most frequent in older lodgepole pine stands.

The distribution and abundance of the most common small mammals within the decadent overstory types of the Cassia Division provides little management information about the community types.

The abundance of deer pellet groups and beds is significantly higher in mid-successional lodgepole pine communities (Table 18 and 20). In aspen and older burned communities, pellet group frequencies were considerably lower. This trend is somewhat similar for deer bedding sites and the use of structural timber types. Higher pellet group densities are associated with mid-sized lodgepole pine canopies (41-48 ft.), low live limbs between 21 and 23 feet high, 77 to 89 percent overstory, canopy coverage, and 60 to 120 stems/plot. The stems/plot decline as Alpine fir and aspen enter the canopy (20 to 54 stems/plot). Bedding sites are characterized by taller trees (48-51 ft.), low live limb 22-24 feet high, and lodgepole canopy coverage of 76 percent. Bedding sites are seldom observed in pure aspen stands.

Avian communities

The response of selected indicator bird species to habitat types is depicted in Table 22. Blue grouse do not appear to be influenced by habitat type. This species appears to select roosting sites across the spectrum of habitat types in about the same proportion as the types naturally occur within the study area. Brown creepers were not observed in ABLA/CARU and frequencies of hairy woodpecker observations were lower than one would expect (4%). This response could be a reflection of shorter trees (46 feet), smaller DBH (6.4"), and a mixture of saw timber and poles common to this type.

Goshawks were not observed in ABLA/ARCO type stands.

Table 23 displays the response of woodpecker species to sites classed by habitat type. It appears that these birds select habitat types with fewer stems/plot. Of these species, the downy woodpecker is most tolerant of high stem densities.

As is the case with small mammals, habitat types that do not relate to the present stand conditions have little predictive value as to the composition of the associated bird community.

To aid in the analyses of bird-community relationships, bird species were placed in groups with similar feeding and nesting requirements. The relationships between these bird guilds and community types are found in Table 24. Only the densities of aerial feeders and foliage nesting guilds were found to be significantly different among the community types. The aerial feeding species appear to select older stands of lodgepole pine and burned areas. Both foliage nesters and aerial feeders were more abundant in the regenerating lodgepole pine communities. The calculated values for species evenness (J') were significantly lower in lodgepole saw timber (J' = .80) and burned (J' = .82) stands. This finding is the result of several species dominating the bird communities of these types.

The response of bird guilds to structural types is found in Table 25. Birds associated with the insect feeding guild are most abundant in older more decadent lodgepole pine communities. This probably reflects the insect populations present in these stands. Aerial feeders selected stands with

aspen as an important constituent of the canopy. However, some conifer stands, particularly those with Alpine fir appear to be important to these birds.

Cavity nesting species preferred structural types characterized tall trees (48-51 ft.), DBH (8.2"-9.9"), basal area (115-152) and 10 to 13 saw timber stems/plot.

The number of blue grouse roost sites (Table 26) was significantly higher in regenerating lodgepole pine stands (2.6/plot) and older stands of lodgepole pine-fir (3.3/plot). These types commonly have little or no aspen in the canopy and low forb production.

The common flicker and mountain chickadee were the only nongame birds with densities that were significantly different between structural types (Table 27). Flicker densities were highest in older lodgepole pine stands or stands with significant amounts of aspen in the canopy. Mountain chickadee abundance increased in old stands with only minor amounts of aspen.

Comparative Methods of Analysis

Principal component analysis

In order to reduce the array of bird species and stand parameters, the analysis of principal habitat components was completed. Table 28 displays these results for selected species. Important stand parameters were selected from Table 28 for the brown creeper and hairy woodpecker. For these indicator bird species, stand species composition, tree height, DBH, percent standing live, stand age, and the number of poles and saw timber stems are considered the most important for describing avian habitat.

Field checks

Field validation checks were made by an independent team of wildlife biologists. The characteristics of stands selected by this team are compared with the stand parameters developed from this study in Table 29. The stand parameters from both investigations support the values of critical stand elements developed for selecting important wildlife stands (Table 30).

QWICK QWERY stand summaries

A QWICK QWERY automatic data program was developed by utilizing the constraints with the most statistical and biological validity. The program basically searches the Cassia Division timber file and selects only those stands that meet all of the constraints for an important indicator species. This list of stands was summarized for total acres and the selected stands were then plotted on a planning overlay.

The overstory composition and total number of brown creeper stands are displayed in Table 31. Six hundred eighty stands (27%) are considered prime brown creeper stands and the majority of these stands are pure lodgepole pine (54%). Because of the slope constraint associated with present harvesting methods only stands on slopes less than 40 percent were considered.

Prime goshawk and blue grouse stands are characterized in Table 32. For these species, only conifer stands were selected. As in the case of the brown creeper, only a small number of the areas total stands (4-13%) meet the criterion for goshawk and blue grouse habitat.

Deer stands are presented in Table 33. This summary also divides the stands into management age classes. On the slopes available for harvest, 360 (13%) of the areas stands are presently considered prime deer cover. Most of these stands are also considered saw timber. Of the 2,538 stands on the study area, only 33 (1%) are in a successional stage that will develop into a prime deer stand. These same proportions are true for stands on slopes greater than 41 percent. On both slope types, lodgepole pine represents the majority of the important deer cover.

Because of the possibility that deer and goshawk reproductive and rearing behavior could be influenced by road traffic, stands important to these animals are summarized in relationship to road proximity (Table 34). Of the 393 (17%) stands within 500 feet of a road, 127 (32%) are considered prime deer cover. There are 73 (3%) goshawk stands within 500 feet of a road. Twenty nine (40%) of these stands represent potential goshawk nesting sites.

SUMMARY AND MANAGEMENT RECOMMENDATIONS

While the data collection and habitat analysis techniques presented are not a panacea for solving all the difficulties involved in an evaluation of this magnitude, they do attempt to place wildlife-habitat relationships in a successional perspective.

From a comprehensive point of view, the Cassia Division is hampered by an abundance of older stands and dead wood accumulations that provide a high fire potential. In this regard, the following management recommendations are made:

1. A QWICK QWERY method of stand delineation should be used to develop a comprehensive timber harvest plan. This plan should include the anticipated period in which each stand on the evaluation area will be cut or treated over the next one and one half rotation periods (120 years).

2. Present and future wildlife stands should be identified for management indicator species. Care should be taken to ensure an even distribution of these stands remains throughout the study area for the next 120 years.

3. Periodic monitoring of wildlife populations and refinement of the constraint models should continue.

4. Management indicator species should be evaluated as to their usefulness and predictive value.

APPENDICES

Table 1. Landform Habitat Type Relationships on the Cassia Evaluation Area (1979).

Landform[1]	Habitat Type ABLA OSCH	ABLA CARO	ABLA CARU	ABLA ARCO	ABLA BERE	Total
Hillslopes						
211-2					2	2
213-2A	3	2				5
213-2C	5	2	2		1	10
214-2C	16	13	3	9	4	45
215-2C	4			1	1	6
414-3C	2	1		1		4
Canyonlands & Drainageways						
261-1A		1				1
261-2C	3		2	1		6
263-2C	9	1	6	2		18
265-2C	—	—	3	—	—	3
Total	42	20	16	14	8	100[2]

[1] Landform Description

Hillslopes

- 211-2 Volcanic, <10% trees, weakly dissected, 6000-7500 ft.
- 213-2A Volcanic, scattered trees, weakly dissected, 6000-7500 ft., Aspen
- 213-2C Volcanic, scattered trees, weakly dissected, 6000 -7500 ft., Conifer
- 214-2C Volcanic, scattered trees, moderately dissected, 6000-7500 ft., Conifer
- 215-2C Volcanic, scattered trees, strongly dissected, 6000-7500 ft., Conifer
- 414-3C Limestone, scattered trees, moderately dissected, >7500 ft., Conifer

Canyon lands & Drainageways

- 261-1A Volcanic, weak dissection, smooth slope, 6000-7500 ft., Aspen
- 261-2C Volcanic, weak dissection, smooth slope, 6000-7500 ft., Conifer
- 263-2C Volcanic, moderate dissection, 6000-7500 ft., Conifer
- 265-2C Volcanic, strongly dissected, 6000-7500 ft., Conifer

[2] All tabular values are percent of total.

Table 2. Summary of Overstory Stands by Acreage, Percent of Total Overstory Acreage, Average DBH, and Tree Height on the Cassia Evaluation Area (1979).

Overstory Type	Acres			Total Stands (%)		DBH ($\bar{X}$)	Height ($\bar{X}$)
	Total	$\bar{X}$	%				
Alpine Fir	850	9.3	4	91	4	9.9	56.8
Alpine Fir/Lodgepole Pine	3,329	13.9	14	239	9	8.7	52.7
Aspen	8,848	10.9	35	811	33	5.4	29.5
Aspen/Alpine Fir	1,227	11.6	5	105	4	6.8	39.5
Aspen/Lodgepole Pine	1,190	9.5	5	125	5	6.8	35.2
Chokecherry	15	5.0	T	3	T		
Ceanothus	192	11.3	1	17	1		
Douglas Fir	22	4.4	T	5	T	5.0	19.8
Lodgepole Pine	8,383	7.4	35	1,126	44	7.7	41.1
Mt. Mahogany	159	15.9	1	10	T	7.0	30.0
Willow	39	6.5	T	6	T		
Total	24,254			2,538			

Table 3. Distribution of Overstory Species by Slope and Age Class for the Cassia Evaluation Area (1979).

	Total Stands			Stand Origin 1980-1941			Stand Origin 1940-1927			Stand Origin 1926-1897			Stand Origin 1896 +		
Stand Type[1]	# Stands	$\bar{X}$ DBH	$\bar{X}$ HT	# Stands	$\bar{X}$ DBH	$\bar{X}$ HT	# Stands	$\bar{X}$ DBH	$\bar{X}$ HT	# Stands	$\bar{X}$ DBH	$\bar{X}$ HT	# Stands	$\bar{X}$ DBH	$\bar{X}$ HT
Slope ≥ 41%															
AF	26 (12%)[2]	9.1	54.0	2	6.5	29.0	5	7.4	58.8	2	9.0	44.0	17	9.9	55.0
AFLP	42 (18%)[2]	6.8	41.7	10	5.2	23.5				10	8.2	55.2	22	8.8	53.8
AS	105 (46%)[2]	4.8	28.4	12	3.3	20.8	28	4.4	26.7	25	6.3	38.0	40	4.5	25.8
ASAF	16 (7%)[2]	6.3	40.9				6	6.7	40.0	6	6.2	47.7	4	5.8	32.3
ASLP	6 (3%)[2]	7.3	41.0	1	3.0	17.0				1	8.0	68.0	4	8.3	40.3
CC	1												1		
CE	3 (1%)[2]												3		
LP	27 (12%)[2]	7.1	40.9	6	4.0	18.5	1	14.0	48.0	4	8.5	46.3	16	7.5	47.5
MM	2												2		
Total	228 (9%)[3]			31 (14%)[2]			40 (18%)[2]			48 (21%)[2]			109 (48%)[2]		
Slope ≤ 40%															
AF	65 (3%)[2]	9.9	55.7	2	7.0	27.0	6	7.3	40.0	16	7.9	48.4	41	11.2	61.9
AFLP	197 (9%)[2]	9.1	54.9	15	3.8	32.2	1	6	42.0	24	8.6	54.2	157	9.7	57.4
AS	705 (31%)[2]	5.5	29.6	77	3.9	17.7	164	5.4	28.3	183	6.5	37.0	281	5.3	28.9
ASAF	89 (4%)[2]	6.9	39.3	8	4.1	34.1	21	6.2	37.5	28	7.0	38.4	32	7.8	42.6
ASLP	120 (5%)[2]	6.8	34.6	12	3.4	16.4	9	12.0	37.7	31	6.6	38.9	68	6.7	35.7
CC	2												2		
CE	14 (1%)[2]									1			13		
DF	5	5.0	19.8										5	5.0	19.8
LP	1,099 (47%)[2]	7.7	41.4	216	2.5	10.5	10	6.1	34.8	65	7.4	43.8	808	9.2	49.1
MM	8												8		
WI	6												6		
Total	2,310 (91%)[3]			330 (14%)[2]			211 (9%)[2]			348 (15%)[2]			1,421 (62%)[2]		

[1] Stand type codes: AF-Alpine fir, AS-Aspen, CC-Chokecherry, CE-Ceanothus, LP-Lodgepole, MM-Mountain Mahogany.
[2] Percent of stands within slope class.
[3] Percent of total stands within evaluation area.

Table 4. Summary of All Stands Found on the Cassia Wildlife Evaluation Area Classified by Slope and Overstory Type (1979).

	Stands	%[1]	Acres	%
Slope ≤ 40%				
Managed Conifer	1,366	54	11,265	46
Aspen	705	28	7,567	31
Mixed Aspen Conifer	209	8	2,154	9
Other Types[2]	30	1	279	1
Total	2,310	91%	21,265	87%
Slope ≥ 41%				
Unmanaged Conifer	95	4	1,320	6
Aspen	105	4	1,276	5
Mixed Aspen Conifer	22	1	319	1
Other Types	6	T	126	1
Total	228	9%	3,041	13%
GRAND TOTAL	2,538		24,306	

[1] Percent of total.

[2] Other types include chokecherry, ceanothus, Mt. mahogany, and willow.

Table 5. Summary of Stands on the Cassia Wildlife Evaluation Area Classified by Slope and Age Class (1979).

	# Stands	% of Total[1]
Slope Less than 40% (Managed)		
>81 years	1,421	56%
51-80 years	348	14%
36-50 years	211	8%
0-35 years	330	13%
Total	2,310	91%
Slope Greater than 41% (Unmanaged)		
>81 years	109	4%
51-80 years	48	2%
36-50 years	40	2%
0-35 years	31	1%
Total	228	9%

[1] Percent of 2,538 stands on the Cassia Wildlife Evaluation Area.

Table 6. Relationship Between Habitat Types, Community Types and Structural Associations on the Cassia Evaluation Area (1979).

	Habitat Type[1]					
	ABLA[2] OSCH	ABLA CARO	ABLA CARU	ABLA ARCO	ABLA BERE	Total Plots
Community Type	32 (42%)[2]	14 (19%)	11 (15%)	10 (14%)	6 (8%)	73
Structural Association	34 (40%)	19 (22%)	10 (12%)	14 (16%)	8 (9%)	85
Climax Type[1]	42%	20%	16%	14%	8%	100

1. Habitat Type Codes ABLA/OSCS - Abies lasiocarpa/Osmorhiza chilensis
ABLA/CARO - Abies lasiocarpa/Carex rossii
ABLA/CARU - Abies lasiocarpa/Calamagrostis rubescens
ABLA/ARCO - Abies lasiocarpa/Arnica corditotea
ABLA/BERE - Abies lasiocarpa/Berberis repens

Definitions follow Steele, R., R.D. Pfister, R.A. Ryker, and J.A. Kittams. 1979. Forest habitat types of central Idaho. USDA For. Serv. Gen. Tech. Rep. INT - (in process), Intermt. For. and Range Exp. Stn., Ogden, Utah.

2. Percentage of total plots observed.

Table 7. Characteristic Parameters of Stands in the Cassia Evaluation Area Classified by Habitat Type (1979).

Parameter		Habitat Type ABLA OSCH	ABLA CARO	ABLA CARU	ABLA ARCO	ABLA BERE	F Ratio[1]
Overstory Species (%)[2]	LP	68%	65%	80%	31%	100%	
	AF	21%	18%	15%	46%		
	AS	11%	17%	5%	23%		
Age		77.2	76.6	74.6	78.7	78.6	.27
DBH		7.7	7.4	6.4	7.6	7.0	1.05
Tree Height (ft)		46.1	46.4	46.0	47.8	50.5	1.02
Low Live Limb (ft)		20.5	19.9	22.7	19.8	24.6	1.10
Crown Radius (ft)		5.5 (1)[3]	5.0 (1)	3.8 (3)	4.6 (2)	4.9 (2)	5.66*
% Overstory		75.8 (2)	75.2 (2)	77.9 (2)	75.4 (2)	87.6 (1)	2.61*
Nearest Neighbor Distance (ft)		11.1	10.5	8.6	10.5	8.9	1.52
Basal Area/Plot		168.9	160.5	163.2	159.4	214.5	1.72
Total Stems/Plot		51.4 (2)	44.8 (2)	76.6 (1)	50.1 (2)	70.9 (1)	2.52*
Live Saw Timber Stems/Plot		15.1	14.5	12.4	14.5	17.5	.76
Live Pole Timber Stems/Plot		19.8	17.1	39.6	24.4	30.9	2.09
% Dead (Saw and Pole Timber)		31.3%	27.4%	31.0%	23.8%	34.9%	1.07

[1] Tabular F = 2.50 ($P \leq .05$, df 4/71).
[2] Overstory codes are AF = Alpine Fir, LP = Lodgepole Pine, AS = Aspen.
[3] Means with similar numbers in parenthesis are not significantly different.

Table 8. Characteristic Parameters of Stands in the Cassia Evaluation Area Classified by Community Type (1979).

Parameter		Community Type							F Ratio[1]
		Burn	LP-Pole	LP-Reg	LP-Saw	LP-Mix	LP-Fir	Aspen	
Overstory Species (%)[2]	LP	35%	100%	98%	100%	25%	72%		
	AF	27%				55%	28%		
	AS	38%		2%		20%		100%	
Age		22 (3)	76.6 (2)	70.4 (2)	83.8 (1)	84.6 (1)	78.9 (1)	59.7 (2)	4.06*
DBH		4.9 (3)	5.5 (3)	8.5 (2)	8.8 (2)	10.2 (1)	8.2 (2)	5.4 (3)	12.74*
Tree Height (ft)		34.2 (3)	43.2 (2)	46.8 (1)	48.7 (1)	43.9 (2)	46.4 (1)	35.5 (3)	2.87*
Low Live Limb (ft)		19.4 (2)	23.4 (1)	20.7 (1)	23.1 (1)	12.8 (3)	17.6 (2)	19.6 (2)	3.96*
Crown Radius (ft)		5.1	4.0 (2)	5.5 (1)	5.4 (1)	5.7 (1)	5.0 (1)	5.4 (1)	7.66*
% Overstory		-	82.8 (1)	83.7 (1)	79.5 (1)	73.8 (1)	67.3 (2)	61.4 (2)	6.37*
Nearest Neighbor Distance (ft)		-	7.45(3)	10.6 (2)	10.8 (2)	12.3 (1)	12.8 (1)	13.4 (1)	9.62*
Basal Area/Plot		-	190.7 (1)	196.8 (1)	201.4 (1)	118.9 (2)	154.8 (2)	62.3 (3)	6.59*
Total Stems/Plot		32.0 (3)	96.6 (1)	51.5 (2)	40.8 (3)	40.7 (3)	34.8 (3)	34.8 (3)	22.03*
Live Saw Timber Stems/Plot		0.0	13.1 (2)	16.3 (1)	18.2 (1)	10.2 (2)	11.7 (2)	3.5 (3)	3.47*
Live Pole Timber Stems/Plot		15.6 (2)	57.1 (1)	18.3 (2)	8.7 (3)	24.5 (2)	11.3 (3)	23.0 (2)	17.55*
% Dead (Saw and Pole Timber)		-	28.9 (1)	24.3 (1)	32.6 (1)	17.4 (2)	33.1 (1)	6.0 (3)	2.59*

[1] Tabular F = 2.24 ($P \leq .05$, df 6/65).
[2] Overstory codes are AF = Alpine Fir, LP = Lodgepole Pine, AS = Aspen.
[3] Means with similar numbers in parenthesis are not significantly different.

Table 9. Characteristic Parameters of Stands in the Cassia Evaluation Area Classified by Structural Components (1979).

Parameter	Structural Component Group										Calculated F Ratio[1]
	A	B	C	E	D	F	H	I	G	J	
Overstory Species (%)[2] LP	100%	100%	100%	100%	100%	95%	50%	4%	95%		
AF						5%	50%	64%			
AS								32%	5%	100%	
Age	73.6 (2)[3]	71.0 (2)	79.7 (1)	82.7 (1)	82.7 (1)	79.2 (1)	76.7 (1)	60.1 (3)	73.9 (2)	53.2 (4)	4.80*
DBH	4.9 (4)	6.2 (3)	6.8 (3)	8.7 (2)	9.9 (1)	7.7 (2)	8.2 (2)	5.7 (3)	8.2 (2)	5.0 (4)	14.23*
Tree Height (ft)	41.9 (2)	44.5 (2)	47.8 (1)	47.8 (1)	50.6 (1)	48.0 (1)	48.2 (1)	36.8 (3)	48.9 (1)	35.5 (3)	4.49*
Low Live Limb (ft)	23.3 (1)	21.0 (1)	23.7 (1)	19.8 (1)	22.4 (1)	20.5 (1)	15.6 (2)	11.4 (3)	22.7 (1)	17.5 (2)	2.80*
Crown Radius (ft)	3.1 (4)	4.9 (3)	4.9 (3)	4.9 (3)	6.2 (1)	4.7 (3)	5.5 (2)	5.4 (2)	5.6 (2)	5.4 (2)	6.89*
% Overstory	85.6 (1)	84.3 (1)	76.5 (2)	79.2 (2)	75.6 (2)	66.0 (3)	70.7 (2)	73.5 (2)	78.6 (2)	61.4 (3)	5.77*
Nearest Neighbor Distance (ft)	6.3 (4)	8.3 (3)	9.1 (3)	10.9 (2)	13.8 (1)	11.4 (2)	13.2 (1)	11.7 (2)	11.5 (2)	13.4 (1)	8.80*
Basal Area/Plot	190.1 (1)	205.1 (1)	179.3 (1)	181.9 (1)	133.4 (2)	152.3 (2)	115.3 (3)	111.0 (3)	151.5 (2)	62.3 (4)	6.48*
Total Stems/Plot	124.9 (1)	81.4 (2)	59.3 (3)	33.1 (4)	20.5 (5)	38.6 (4)	27.0 (4)	54.0 (3)	35.3 (4)	34.8 (4)	82.5 *
Live Saw Timber Stems/Plot	5.8 (3)	17.6 (1)	18.4 (1)	17.8 (1)	12.0 (2)	13.7 (2)	10.4 (2)	8.6 (3)	17.3 (1)	3.5 (4)	8.11*
Live Pole Timber Stems/Plot	80.3 (1)	37.7 (2)	22.6 (3)	7.3 (4)	4.4 (4)	11.9 (4)	10.2 (4)	38.4 (2)	12.8 (4)	23.0 (3)	29.85*
% Dead (Saw and Pole Timber)	31.3 (1)	33.6 (1)	31.5 (1)	32.7 (1)	18.6 (3)	33.4 (1)	26.9 (2)	13.2 (3)	15.5 (3)	7.3 (4)	3.33*

[1] Tabular F = 2.67 ($P \leq .05$, df 9/75).
[2] Overstory codes are AF = Alpine Fir, LP = Lodgepole Pine, AS = Aspen.
[3] Means with similar numbers in parenthesis are not significantly different.

Table 10. The Relationship Between Herbage Productions (lbs/Ac), Understory Canopy Cover (%), and Habitat Types on the Cassia Evaluation Area (1979).

Habitat Types	Understory Canopy Coverage (%)	Herbage (Dry Wt. lbs/Ac.)			
		Browse	Forb	Grass	Total
ABLA/OSCH	6.3 (2)[2]	8.0	47.2 (2)	10.4	65.6
ABLA/CARO	6.1 (2)	8.9	22.4 (3)	19.6	50.9
ABLA/CARU	5.2 (2)	2.1	19.2 (3)	20.3	41.6
ABLA/ARCO	9.8 (1)	11.5	61.6 (1)	9.0	82.1
ABLA/BERE	4.0 (2)	16.3	13.6 (3)	11.1	41.0
F Ratio[1]	2.63*	1.81	2.90*	1.98	1.13

[1] Tabular F = 2.23 ($P \leq .05$, df 6/24)
[2] Means with similar numbers in parenthesis are not significantly different.

Table 11. The Relationship Between Herbage Productions (lbs/Ac), Understory Canopy Cover (%), and Community Types on the Cassia Evaluation Area (1979).

Community Types	Understory Canopy Coverage (%)	Herbage (Dry Wt. lbs/Ac.) Browse	Forb	Grass	Total
Burn	24.0 (1)	143.7 (1)	779.5 (1)	314.5 (1)	1237.7 (1)
LP-Pole	4.7 (3)	7.9 (3)	18.6 (4)	11.7 (2)	38.2 (3)
LP-Reg	8.1 (2)	14.9 (3)	21.6 (4)	17.3 (2)	53.8 (3)
LP-Saw	7.1 (2)	48.3 (2)	10.8 (4)	15.9 (2)	75.0 (3)
LP-Mix	13.2 (2)	15.3 (3)	149.4 (2)	33.5 (2)	198.2 (2)
LP-Fir	9.6 (2)	12.6 (3)	55.9 (3)	14.6 (2)	83.1 (3)
Aspen	27.0 (1)	153.3 (1)	694.3 (1)	234.0 (1)	1081.6 (1)
F Ratio[1]	16.94*	10.43*	22.77*	20.70*	41.68*

[1] Tabular F = 2.23 ($P \leq .05$, df 6/74).
[2] Means with similar numbers in parenthesis are not significantly different.

Table 12. The Relationship Between Herbage Productions (lbs/Ac), Understory Canopy Cover (%), and Structural Type on the Cassia Evaluation Area (1979).

Structural Types	Understory Canopy Coverage (%)	Herbage (Dry Wt. lbs/Ac.)			
		Browse	Forb	Grass	Total
A	3.1 (4)[2]	3.3 (4)	7.6 (4)	11.4 (3)	22.3 (6)
B	4.0 (4)	11.4 (3)	21.7 (4)	8.3 (3)	41.4 (5)
C	5.6 (4)	6.2 (4)	21.2 (4)	13.5 (3)	40.9 (5)
E	5.1 (4)	3.4 (4)	8.5 (4)	4.9 (3)	16.8 (6)
D	8.8 (3)	9.1 (3)	58.0 (3)	25.8 (2)	92.9 (3)
F	7.6 (3)	10.7 (3)	40.7 (3)	11.0 (3)	62.4 (4)
H	10.7 (3)	9.9 (3)	75.9 (3)	19.5 (2)	105.3 (3)
I	15.5 (2)	21.4 (2)	225.8 (2)	27.2 (2)	274.4 (2)
G	9.0 (3)	12.0 (3)	51.3 (3)	25.8 (2)	89.1 (3)
J	27.3 (1)	130.0 (1)	846.8 (1)	206.8 (1)	1183.6 (1)
F Ratio[2]	16.48*	26.81*	23.09*	27.58*	48.12*

[1] Tabular F = 2.01 ($P \leq .05$, df 9/71)
[2] Means with similar numbers in parenthesis are not significantly different.

Table 13. Relationships Between Downed Wood Accumulations[1] and Habitat Types on the Cassia Evaluation Area (1979).

Habitat Types	Live Woody Materials		Dead Woody Materials		Downed Logs (> 3.0" dia.)	Total Dead Woody Materials
	Stems & Twigs	Branches	Stems & Twigs	Branches		
ABLA/OSCH	.13	.05	3.79	8.03	7.85	19.67
ABLA/CARO	.17	.13	3.96	7.72	6.81	18.49
ABLA/CARU	.05	.07	3.94	10.47	4.79	19.20
ABLA/ARCO	.27	.05	3.58	7.29	6.23	17.10
ABLA/BERE	.02	.08	3.19	6.55	4.44	14.18
F Ratio[1]	2.43	.41	.57	.89	.91	.68

[1] Accumulations are in tons/acre.
[2] Tabular F = 2.50 ($P \leq .05$, df 4/71).

Table 14. Relationships Between Downed Wood Accumulations[1] and Community Types on the Cassia Evaluation Area (1979).

Community Types	Live Woody Materials		Dead Woody Materials		Downed Logs (> 3.0" dia.)	Total Dead Woody Materials
	Stems & Twigs	Branches	Stems & Twigs	Branches		
Burn	.153 (3)	.050 (2)	1.10 (4)	4.17 (3)	.75 (4)	6.02 (4)
LP-Pole	.039 (4)	.036 (2)	4.32 (1)	10.90 (1)	5.03 (3)	20.25 (1)
LP-Reg	.121 (3)	.000 (3)	3.64 (2)	7.70 (2)	8.45 (2)	19.79 (1)
LP-Saw	.029 (4)	.016 (3)	3.22 (2)	4.22 (3)	5.56 (3)	13.00 (2)
LP-Mix	.700 (1)	.346 (1)	3.84 (2)	7.03 (2)	7.27 (3)	18.14 (1)
LP-Fir	.329 (2)	.037 (2)	4.24 (1)	7.70 (2)	10.06 (1)	22.00 (1)
Aspen	.707 (1)	.567 (1)	2.08 (3)	4.33 (3)	5.59 (3)	12.00 (2)
F Ratio[1]	19.32*	6.70*	2.29*	5.33*	2.38*	2.56*

[1] Accumulations are in tons/acre.
[2] Tabular F = 2.23 ($P \leq .05$, df 6/74).

Table 15. Relationships Between Downed Wood Accumulations[1] and Structural Types on the Cassia Evaluation Area (1979).

Structural Types	Live Woody Materials		Dead Woody Materials		Downed Logs (> 3.0" dia.)	Total Dead Woody Materials
	Stems & Twigs	Branches	Stems & Twigs	Branches		
A	.09 (4)	.05 (3)	4.24 (1)	14.71 (1)	4.21 (2)	23.16 (1)
B	.05 (4)	.02 (3)	3.82 (1)	9.51 (2)	5.15 (2)	18.48 (1)
C	.07 (4)	.00 (3)	4.10 (1)	8.10 (2)	7.74 (2)	19.94 (1)
E	.07 (4)	.11 (3)	3.05 (1)	4.72 (3)	3.98 (2)	11.75 (3)
D	.06 (4)	.02 (3)	2.91 (2)	4.24 (3)	4.79 (2)	11.94 (3)
F	.26 (3)	.00 (3)	4.12 (1)	7.11 (2)	7.55 (2)	18.78 (1)
H	.44 (2)	.24 (2)	3.92 (1)	6.08 (3)	11.40 (1)	21.40 (1)
I	.90 (1)	.29 (2)	4.57 (1)	9.40 (2)	6.41 (2)	20.38 (1)
G	.12 (4)	.03 (3)	3.50 (1)	7.99 (2)	3.75 (2)	15.24 (2)
J	.44 (2)	.46 (1)	1.70 (3)	3.91 (3)	6.90 (2)	12.51 (3)
F Ratio[2]	11.54*	3.16*	2.24*	4.87*	2.21*	2.23*

[1] Accumulations are in tons/acre.
[2] Tabular F = 2.00 ($P \leq .05$, df 9/75).

Table 16. Relationship Between Selected Small Mammal Diversity (H'), Species Evenness (J'), Numbers[1], and Deer Pellet Groups and Deer Beds and Habitat Types or the Cassia Evaluation Area (1979).

	Habitat Type					
	OSCH	CARO	CARU	ARCO	BERE	F. Ratio[2]
Diversity (H')	.81 (1)	.61 (2)	.84 (1)	.88 (1)	.57 (2)	3.38*
Evenness (J')	.74	.67	.79	.76	.62	1.21
Eutamias spp.	8.2	8.6	6.4	8.1	8.5	.28
Peromyscus maniculatus	2.0	1.1	2.0	1.6	1.0	1.27
Spermophilus lateralis	1.0	.9	1.1	1.1	1.0	.07
Deer Pellet Groups/Site	2.4	5.2	3.1	2.6	2.8	.56
Deer Beds/Site	1.6	1.4	2.0	1.9	2.2	.24

[1] Numbers represent average density/study site.
[2] Tabular F = 2.52 ($P \leq .05$, df 4/59).

Table 17. Relationship Between the Frequency (% of sites) that Small Mammals were Trapped, and Deer Signs were Observed in Habitat Types Sampled on the Cassia Evaluation Area (1979).

Species	Habitat Type				
	OSCH	CARO	CARU	ARCO	BERE
Eutamias spp.	100	100	100	100	100
Mustela erminea	7	8		13	
Mustela frenata	28	46	38	23	50
Microtus longicaudus	13		13	23	
Microtus Montanus	21		25		
Neotoma cinerea			13		
Peromyscus maniculatus	90	62	63	75	67
Spermophilus beldingi	7	8			
Spermophilus lateralis	52	8	50	46	33
Thomomys talpoides				13	
Zapus princeps	7				
Deer Pellet Counts	59	100	75	50	67
Deer Bed Counts	59	46	63	50	67

Table 18. Relationship Between Selected Small Mammals, Diversity (H'), Species Evenness (J'), Numbers[1], Deer Pellet Groups, Deer Beds, and Community Types on the Cassia Evaluation Area (1979).

	Community Type							
	Burn	LP-Pole	LP-Reg.	LP-SAW	LP-Mix	LP-Fir	Aspen	F Ratio[2]
Diversity (H')	1.20 (1)[3]	.74	.73 (3)	.64 (3)	.78 (2)	.84 (2)	.98 (1)	2.89*
Evenness (J')	.85	.80	.67	.68	.67	.76	.89	1.47
Eutamias spp.	4.7 (4)	4.8 (4)	7.9 (2)	6.8 (3)	10.1 (1)	8.2 (2)	6.0 (3)	2.39*
Mustela spp.	0.2	0.1	0.0	0.3	0.5	0.3	0.7	1.28
Microtus spp.	1.2 (2)	0.1 (3)	0.3 (3)	0.0 (3)	0.5 (3)	0.3 (3)	4.0 (1)	6.45*
Peromyscus maniculatus	2.3 (1)	1.7 (2)	0.4 (3)	0.6 (3)	1.3 (2)	0.8 (3)	1.7 (2)	2.62*
Spermophilus lateralis	3.2 (1)	0.4 (2)	1.0 (2)	0.6 (2)	0.5 (2)	0.7 (2)	0.0 (3)	4.88*
Type Total	12.2	7.8	10.4	8.3	13.1	10.3	12.3	
Deer Pellet Groups/Site	.3 (2)	3.8 (1)	3.3 (1)	3.3 (1)	2.8 (1)	3.2 (1)	0.3 (2)	2.25*
Deer Beds/Site	.7 (2)	2.6 (1)	1.7 (1)	1.4 (1)	1.0 (1)	.5 (2)	0.0 (3)	2.24*

[1] Numbers represent average density/study site.
[2] Tabular F = 2.23 ($P \leq .05$, df 6/74)
[3] Numbers in parenthesis indicate groups that are statistically similar.

Table 19. Relative Frequency (%) of Small Mammal Occurrence on Community Type Study Plots, Cassia Evaluation Area (1979).

Mammal Species	Community Type						
	Burn (6 Stands)	LP-Pole (18 Stands)	LP-Regeneration (7 Stands)	LP-Saw (16 Stands)	LP-Mixed (10 Stands)	LP-Fir (15 Stands)	Aspen (3 Stands)
Eutamias spp.	100	100	100	100	100	100	100
Peromyscus maniculatus	67	78	43	31	70	33	67
Spermophilus lateralis	100	17	29	38	20	53	0
Mustela spp.	17	6	0	19	40	20	33
Microtus spp.	67	11	14	0	30	20	67

Table 20. Relationship Between Selected Small Mammals, Diversity (H'), Species Evenness (J'), Numbers[1], Deer Pellet Groups, Deer Beds, and Structural Types on the Cassia Evaluation Area (1979).

	Structural Type										
	A	B	C	E	D	F	H	I	G	J	F Ratio[2]
Diversity (H')	.73	.69	.71	.56	.71	.64	.74	.91	.52	1.10	1.41
Evenness (J')	.91	.74	.68	.59	.68	.64	.67	.77	.54	.90	.14
Eutamias spp.	3.7 (3)[3]	6.7 (2)	8.4 (2)	11.8 (1)	7.0 (2)	10.8 (1)	10.9 (1)	6.6 (2)	11.5 (1)	6.5 (2)	2.49*
Microtus longicaudus	0.0 (2)	0.0 (2)	0.1 (2)	0.0 (2)	0.0 (2)	0.0 (2)	0.2 (2)	0.0 (2)	0.0 (2)	2.5 (1)	4.15*
Microtus montanus	0.0 (3)	0.1 (3)	0.1 (3)	0.0 (3)	0.0 (3)	0.0 (3)	0.3 (2)	0.8 (1)	0.0 (3)	1.0 (1)	2.77*
Peromyscus maniculatus	2.0	2.3	1.4	1.4	.3	1.3	1.4	1.2	2.0	2.0	1.12
Spermophilus lateralis	0.0 (2)	0.6 (2)	0.6 (2)	0.8 (2)	1.5 (1)	0.8 (2)	0.6 (2)	1.0 (1)	0.5 (2)	1.0 (1)	2.46*
Type Total	7.34	11.13	11.99	15.15	10.19	14.18	14.81	11.28	15.06	15.0	
Deer Pellet Groups/Site	2.6 (1)	3.1 (1)	2.5 (1)	1.9 (2)	1.3 (2)	0.6 (3)	0.9 (3)	1.6 (2)	0.8 (3)	0.0 (3)	2.12*
Deer Beds/Site	4.1 (2)	2.5 (3)	4.9 (1)	4.0 (2)	5.3 (1)	2.6 (3)	2.7 (3)	3.2 (2)	2.8 (3)	0.3 (4)	2.15*

[1] Numbers represent average density/study site.
[2] Tabular F = 2.09 ($P < .05$, df 9/45)
[3] Numbers in parenthesis indicate groups that are statistically similar.

Table 21. Relationship Between the Frequency (% of sites) that Small Mammals were Trapped, and Deer Signs were Observed in Structure Types Sampled on the Cassia Evaluation Area (1979).

Species	Structure Type									
	A	B	C	D	E	F	G	H	I	J
Eutamias spp.	100	100	100	100	100	100	100	100	100	100
Mustela erminea		9							20	
Mustela frenata		18	38	40	33	50	43	60		25
Microtus longicaudus			13				29			50
Microtus Montanus		9					29	40		50
Neotoma cinerea	33	9								
Peromyscus maniculatus	100	82	88	80	33	50	57	80	100	75
Spermophilus beldingi					17					
Spermophilus lateralis		33	38	60	83	75	43	40	50	25
Deer Pellet Counts	100	94	100	78	63	86	70	80	50	25
Deer Bed Counts	75	88	77	78	38	43	30	60	50	0

Table 22. The Selection (%) of Habitat Types by Indicator Bird Species on the Cassia Evaluation Area (1979).

	Habitat Type[1]				
	ABLA OSCH	ABLA CARO	ABLA CARU	ABLA ARCO	ABLA BERE
Blue Grouse	47%	25%	8%	17%	3%
Brown Creepers	33%	33%		17%	17%
Goshawk	43%	29%	14%		14%
Hairy Woodpecker	46%	19%	4%	19%	12%

Table 23. A Comparison Woodpecker Habitat Selections on the Cassia Evaluation Area (1979).

Habitat Type (% of Stands Selected)	Woodpecker					F Ratio[1]
	Downy	Hairy	Yell. Sap.	Wm. Sap.	Flicker	
ABLA/OSCH	50%	46%	25%	57%	33%	
ABLA/CARO	50%	19%	25%	29%	33%	
ABLA/CARU		4%				
ABLA/ARCO		19%	25%		17%	
ABLA/BERE		12%	25%	14%	17%	
% Dead in Stand	47%	33%	25%	39%	38%	.86
Trees/Plot	61.0 (1)[2]	53.3 (2)	48.4 (2)	34.8 (3)	36.3 (3)	2.81*

[1] Tabular F = 2.56 ($P \leq .05$, df 4.49).
[2] Means with similar numbers in parenthesis are not significantly different.

Table 24. The Relationship of Bird Feed Guilds, Nesting Guilds, Diversity, and Species Evenness to Community Types on the Cassia Evaluation Area (1979).

	Community Type					Calculated F Ratio[1]
	Burn	LP-Reg	LP-Saw	LP-Mix	LP-Fir	
Feeding Guilds						
Foliage Insect	2.65	2.67	2.80	1.56	3.15	1.91
Foliage Seed	.41	.50	.27	.00	.31	1.15
Ground Insect	1.71	2.17	1.40	1.22	2.00	1.30
Ground Seed	.94	1.17	.73	.44	.92	1.07
Aerial Feeder	.12 (3)[2]	.67 (1)	.07 (3)	.44 (2)	.23 (2)	3.49*
Timber Drill	.53	.67	1.14	.44	.69	1.59
Timber Search	.41	.33	.47	.67	.77	1.28
Nesting Guilds						
Foliage Nester	2.76 (2)	3.83 (1)	2.73 (2)	1.42 (3)	3.08 (2)	2.56*
Cavity Nester	2.12	2.67	2.27	2.89	3.0	1.40
Ground Nester	1.82	1.67	1.20	.89	1.92	2.11
Bird Diversity (H')	1.60	1.76	1.56	1.65	1.67	1.21
Species Evenness (J')	.82 (2)	.91 (1)	.80 (2)	.92 (1)	.91 (1)	2.62*

[1] Tabular F = 2.54 ($P \leq .05$, df 4/55).
[2] Mean number of species per plot with similar number in parenthesis are not significantly different.

Table 25. Significant Differences in Structural Community Selection by Birds Species on the Cassia Evaluation Area (1979).

Structural Type	Bird Species	
	Common Flicker	Mountain Chickadee
A	.25 (2)[1]	1.50 (3)
B	.06 (3)	1.19 (3)
C	.31 (2)	1.23 (3)
E	.56 (1)	2.44 (1)
D	.88 (1)	1.88 (2)
F	.00 (3)	2.00 (1)
H	.09 (2)	2.55 (1)
I	1.00 (1)	1.20 (3)
G	.25 (2)	2.75 (1)
J	.25 (2)	.25 (3)
F Ratio[2]	2.60*	2.34*

[1] Plot density means with similar numbers in parenthesis are not significantly different.

[2] Tabular F = 2.06 ($P \leq .05$, df 9/75)

ıble 26. The Relationship of Bird Feeding Guilds, Nesting Guilds, Diversity, and Species Evenness to Structural Types on the Cassia Evaluation Area (1979).

	Structural Type										Calculated F Ratio[1]
	A	B	C	E	D	F	H	I	G	J	
eeding Guilds											
Foliage Insect	2.3 (2)[1]	2.6 (2)	2.8 (2)	2.7 (2)	3.4 (1)	2.0 (2)	3.4 (1)	.8 (3)	2.5 (2)	1.0 (3)	2.70*
Foliage Seed	.4	.4	.2	.4	.3	.6	.1	.0	.5	.0	1.14
Ground Insect	1.5	1.7	1.5	1.4	1.8	1.9	1.3	1.2	1.3	1.3	.32
Ground Seed	1.0	.6	.9	.3	1.0	.3	1.1	.0	1.0	1.0	1.80
Aerial Feeder	.0 (3)	.1 (3)	.2 (3)	.1 (3)	.1 (3)	.3 (3)	.1 (3)	1.0 (1)	.3 (3)	.8 (2)	5.61*
Timber Drill	.1	.6	.6	.2	.9	.7	.7	.4	.8	.5	1.28
Timber Search	.6	.4	.4	.7	.6	1.1	.4	.8	1.0	.3	1.93
esting Guilds											
Foliage Nester	2.8	2.8	2.8	2.6	2.9	2.3	2.5		3.3	2.8	.75
Cavity Nester	1.9 (3)	1.9 (3)	2.2 (2)	2.6 (2)	3.6 (1)	3.1 (1)	3.0 (1)		3.0 (1)	1.3 (3)	2.77*
Ground Nester	1.3	1.7	1.8	.7	1.5	1.4	1.8		1.3	.8	1.78
rd Diversity (H')	1.52 (2)	1.56 (2)	1.59 (2)	1.50 (2)	1.57 (2)	1.72 (1)	1.45 (2)		1.73 (1)	1.69 (1)	2.09
ecies Evenness (J')	.85	.80	.82	.77	.81	.88	.75		.89	.94	.72

Mean species per plot with similar numbers in parenthesis are not significantly different.
Tabular F = 2.06 ($P \leq .05$, df 9/75).

Table 27. The Selection of Structural and Community Types by Blue Grouse on the Cassia Evaluation Area (1979).

	Structural Type										
	A	B	C	E	D	F	H	I	G	J	F Ratio[1]
Blue Grouse Roost Sites	1.13 (2)[2]	2.63 (1)	1.15 (2)	.22 (3)	1.25 (2)	1.29 (2)	3.30 (1)	.60 (3)	1.50 (2)	.0 (4)	2.98*

	Community Type							
	Burn	LP-Pole	LP-Reg	LP-Saw	LP-Mix	LP-Fir	Aspen	F Ratio[3]
Blue Grouse Roost Sites	0.0 (3)	1.62 (2)	4.57 (1)	.80 (2)	1.60 (2)	2.27 (2)	0.0 (3)	2.35*
Roost Sites/ Study Plots		44%	71%	38%	50%	60%		

[1] Tabular F = 2.06 ($P \leq .05$, df 9/75).
[2] Means with similar numbers in parenthesis are not significantly different.
[3] Tabular F = 2.24 ($P \leq .05$, df 6/74).

Table 28. Major Variables Considered for Stand Selection Criterion on the Cassia Study Area (1979).

Variable	F & G Stands		Study Stands			
	Deer	Blue Grouse	Blue Grouse	Wood-Pecker[1]	Brown Creeper	Goshawk
1. Slope	14.8 (1.7)[2]	14.8 (2.7)	17.5 (2.1)	17.6 (2.5)	24.1 (2.5)	20.1 (3.0)
2. Elevation	7,020 (76)	7,270 (89)	7,145 (55)	7,185 (42)	7,047 (219)	7,074 (89)
3. Stand Age	96.2 (2.2)	98.7 (2.6)	78.7 (2.1)	75.9 (1.8)	73.2 (3.1)	77.2 (4.2)
4. Tree Height	50.6 (1.4)	52.6 (2.7)	45.1 (1.1)	47.8 (.8)	48.1 (2.2)	49.8 (1.8)
5. DBH	8.6 (.4)	9.5 (.6)	7.2 (.3)	7.5 (.4)	7.6 (.6)	7.1 (.6)
6. Living Stems (%)	78	74	69	75	74	76
7. Poles LP	154 (29)	176 (50)	144 (25)	134 (25)	159 (51)	214 (84)
8. AF	13 (9)	3 (3)	14 (9)	5 (3)	2 (2)	
9. AS	39 (17)	4 (4)	1 (1)	4 (3)		
10. Saw Logs LP	250 (27)	205 (30)	148 (13)	172 (13)	205 (15)	169 (34)
11. AF	11 (6)	28 (10)	7 (3)	6 (6)		3 (3)
12. AS	12 (7)					
13. Total Saw Logs	273 (27)	233 (27)	155 (6)	178 (9)	205 (15)	172 (32)
14. Total Poles	206 (50)	183 (44)	159 (18)	143 (19)	161 (49)	214 (84)
15. Standing Dead	105 (29)	90 (15)	49 (11)	107 (13)	95 (21)	93 (18)
16. Deadwood (Tons/Acre)			19.1 (1.3)	18.3 (1.7)	19.3 (3.5)	15.6 (3.2)
17. Herbage (Lbs/Acre)			83.1 (15.8)	105.2 (27.7)	67.2 (18.3)	130.6 (69.3)

[1] Includes Hairy and Downey Woodpeckers.
[2] $S_{\bar{x}}$ Standard Error of the Mean.

Table 29. Relationship Between Major Habitat Variables and Selected Bird Species as Outlined by Principal Component Analysis for the Cassia Evaluation Area (1979).

Habitat Variable	Bird Species: Blue Grouse	Brown Creeper	Common Flicker	Hairy Woodpecker	Junco	Nuthatch	Red Gossbill	Ruby Crown Kinglet
1. Lodge Pole Pine (%)	+[1].197 (4)[2]	+ .123 (1)	- .085 (11)	+ .006 (19)	+ .002 (19)	+ .136 (3)	+ .195 (2)	+ .217 (4)
2. Alpine Fir (%)	- .043 (13)	- .099 (8)	+ .047 (15)	+ .031 (17)	+ .002 (18)	- .080 (10)	- .152 (4)	- .139 (7)
3. Aspen (%)	- .244 (1)	- .079 (11)	+ .076 (13)	- .038 (16)	- .007 (16)	- .119 (5)	- .038 (5)	- .184 (5)
4. % Overstory Cover	+ .013 (16)	- .103 (4)	- .032 (16)	- .191 (4)	- .141 (1)	+ .046 (16)	+ .038 (13)	+ .065 (13)
5. Live Stems (#)	- .009 (18)	- .085 (9)	- .132 (7)	- .200 (2)	- .065 (7)	- .020 (19)	+ .096 (8)	- .052 (14)
6. Standing Dead (#)	+ .009 (19)	- .100 (7)	- .199 (3)	- .104 (7)	+ .014 (13)	- .052 (15)	+ .024 (14)	+ .003 (19)
7. Saw Timber Stems (#)	- .016 (15)	+ .102 (5)	- .133 (6)	+ .029 (18)	- .039 (12)	+ .091 (8)	- .011 (16)	+ .291 (1)
8. Pole Timber Stems (#)	+ .017 (14)	+ .113 (2)	- .095 (10)	- .200 (3)	- .039 (11)	- .059 (14)	+ .105 (7)	- .115 (10)
9. Age	- .154 (6)	+ .056 (13)	+ .016 (17)	+ .045 (13)	+ .096 (6)	+ .075 (12)	+ .000 (19)	+ .263 (3)
10. DBH (inch)	- .066 (12)	+ .109 (3)	+ .265 (1)	+ .174 (5)	+ .114 (3)	+ .114 (6)	+ .003 (18)	+ .175 (6)
11. Height (H)	- .012 (17)	+ .101 (6)	- .004 (18)	+ .125 (6)	+ .057 (10)	+ .078 (11)	+ .010 (17)	+ .264 (2)
12. Nearest Neighbor Distance (ft)	- .118 (8)	+ .047 (14)	+ .192 (4)	+ .229 (1)	+ .111 (5)	+ .127 (4)	- .092 (9)	+ .017 (18)
13. Lowest Live Limb (ft)	- .066 (11)	+ .008 (19)	- .080 (12)	- .044 (14)	+ .011 (15)	- .069 (13)	+ .091 (10)	+ .108 (11)
14. Crown Radius (ft)	+ .105 (9)	+ .011 (18)	+ .212 (2)	+ .054 (11)	+ .003 (17)	- .088 (9)	- .154 (3)	+ .031 (15)
15. Downed Wood (twigs)	+ .119 (3)	+ .021 (17)	- .102 (8)	+ .049 (12)	- .059 (8)	+ .109 (7)	+ 118 (6)	- .028 (17)
16. Downed Wood (branches)	+ .072 (10)	- .060 (12)	- .150 (5)	- .065 (9)	- .113 (4)	+ .029 (18)	+ .224 (1)	- .030 (16)
17. Downed Logs	+ .129 (7)	+ .030 (16)	- .064 (14)	+ .040 (15)	- .012 (14)	- .043 (17)	- .021 (15)	+ .068 (12)
18. Browse (lbs/acre)	- .179 (5)	- .046 (15)	- .001 (19)	- .091 (8)	- .140 (2)	- .188 (1)	+ .063 (12)	- .134 (8)
19. Grass-Forb (lbs/acre)	- .221 (2)	- .082 (10)	+ .098 (9)	+ .059 (10)	+ .059 (9)	- .174 (2)	+ .078 (11)	- .130 (9)

1 The positive or negative effect of the habitat variable on the bird species density.
2 The ranking of the effect of the habitat variable on bird species densities.

Table 30. Ranges of Stand Component Variables Used in Selection of Stands by QWICK QWERY Report Writer for Selected Species on the Cassia Study Area (1979).

Variable	Wildlife Species				
	Deer	Goshawk	Grouse	Brown Creeper	Hairy Woodpecker
1. Stand Species Composition				LP, AF, Mix	LP, AF, Mix
2. Aspect	1,2,3,8,9		1,2,3,8,9		
3. Elevation			7,000 to 7,500 ft.		
4. Slope	5 to 40%		9 to 20%	Lt[1] 40%	Lt 40%
5. Stand Age	70 to 115	66 to 130		Gt[2] 60	Gt 70
6. Tree Height	40 to 60 ft.	40 to 65 ft.	40 to 60 ft.	Gt 38	Lt 42
7. DBH	7 to 11	8 to 13		Gt 7	
8. Living Sten (%)					Gt 70%
9. Total Saw Logs	150 to 412	135 to 220		Lt 300	Lt 350
10. Total Poles		0 to 297		Lt 400	Lt 350
11. Physio Site	2,3		1,3		

[1] Lt = Less than.
[2] Gt = Greater than.

Table 31. Summary of Brown Creeper Stands Developed from the QWICK QWERY[1] of the Wildlife Evaluation Timber Inventory.

	Acres	# Stands	%[2]	Stands by Overstory Type					
				AS	LP	AF	ASAF	ASLP	AFLP
Aspen-Conifer	3,863	396	16	54	192	19	16	30	85
Conifer	2,535	284	11	—	183	19	—	—	82
Total	6,398	680	27%	54	366	38	16	30	164

1 QWICK QWERY ADP summary program that summarized the timber inventory file with the constraints developed for brown creepers on the Cassia Evaluation Area.

2 Percent of 2,538 total stands.

Table 32. Summary of Goshawk, Blue Grouse, and Hairy Woodpecker Stands Developed from the QWICK QWERY[1] of the Wildlife Evaluation Timber Inventory.

	Acres	Stands	%[2]	Stands by Overstory Type	
				AFLP	LP
Goshawk					
Managed Conifer[3]	612	73	3	23	50
Unmanaged Conifer	240	25	1	11	14
Total	852	98	4%	34	64
Blue Grouse	1,901	189	7%		
Hairy Woodpecker	3,352	332	13%	93	239

1 QWICK QWERY ADP summary program that summarized the timber inventory file with the constraints developed for goshawks, blue grouse, and hairy woodpeckers on the Cassia Evaluation Area.
2 Percent of 2,538 total stands.
3 Managed stands have the additional constraint of 26% slope.

Table 33. Summary of Deer Stands Developed from the QWICK QUERY[1] of the Wildlife Evaluation Timber Inventory.

	Acres	# Stands	%[2]	Stands by Overstory Type					
				AS	ASAF	ASLP	AF	AFLD	LP
Managed (Slope ≤ 40%)									
15-69 yr	368	33	1%	15	5	2	5	4	2
70-115 yr	2,489	274	10%	15	2	9	10	60	178
>-116 yr	1,184	86	3%	1	2	1	7	28	47
Total	4,041	393	14%	31	9	12	22	92	227
Unmanaged (Slope ≥ 41%)									
15-69 yr	39	6	T					4	2
70-115 yr	2,080	240	9%				10	60	170
>-116 yr	1,119	82	3%				7	28	47
Total	3,238	328	13%				17	92	219

[1] QWICK QWERY ADP summary program that summarized the timber inventory file with the constraints developed for deer on the Cassia Evaluation Area.

[2] Percent of 2,538 total stands.

Table 34. The Number of Deer, Goshawk, and Total Managed[1] Stands Within 500 Feet of an Active Road on the Cassia Evaluation Area (1979).

Overstory Type	Deer Stands ≥ 115 Yrs	(%)	70-114 Yrs	(%)	15-69 Yrs	(%)	Goshawk Stands Managed	(%1)	Unmanaged	(%)	Managed Stands	
Overstory Type												
AF			3	1%	1	3%					12	T
AFAS											9	T
AFLP	8	9%	16	6%	1	3%	9	13%			52	2%
AS			2	T%	1	3%					63	3%
ASLP	1	1%	7	3%	3	9%					40	2%
LP	16	19%	74	27%	—	—	20	27%	3	12%	366	16%
Total	25	29%	102	37%	6	18%	29	40%	3	12%	542	23%
Total Stands Queried	86	4%	274	12%	33	1%	73	3%	25	1%	2,310	

[1] Defined as stands with ≤ 40 percent slope.

Table 35. Birds Observed on the Cassia Evaluation Area (1979).

Scientific Name	Common Name
Accipiter cooperii (Bonaparte)	cooper's hawk
Accipiter gentilis (Linnaeus)	goshawk
Accipiter striatus (Vieillot)	sharp-shinned hawk
Aeronautes saxatalis (Woodhouse)	white-throated swift
Aquila chrysaetos (Linnaeus)	golden hawk
Alectoris graceca (Meisner)	chukar
Anas platyrhinchos (Linnaeus)	mallard
Aphlecoma coerulescens (Boxc)	scrub jay
Asio otus (Linnaeus)	long-eared owl
Asyndesmus lewis (Gray)	Lewis' woodpecker
Bubo virginianus (Gmelin)	great horned owl
Buteo jamaicensis (Gmelin)	red-tailed hawk
Buteo swainsoni (Bonaparte)	Swainson's hawk
Carpodacus cassinii (Baird)	Cassin's finch
Carpodacus purpureus (Gmelin)	purple finch
Catherpes mexicanus (Swainson)	canyon wren
Centrocercus urophasianus (Bonaparte)	sage grouse
Certhia familiaris (Linnaeus)	brown creeper
Chlorura chlorura (Audubon)	green-tailed towhee
Chordeiles minor (Forster)	common nighthawk
Cinclus mexicanus (Swainson)	dipper
Circus cyaneas (Linnaeus)	marsh hawk
Colpates cafer (Gmelin)	red-shafted flicker

Table 35. (Continued)

Scientific Name	Common Name
Columba livia (Gmelin)	rock dove
Corvus corax (Linneaus)	common raven
Dendragapus obscurus (Say)	blue grouse
Dendrocopus pubescens (Linnaeus)	downy woodpecker
Dencrocopus villosus (Linnaeus)	hairy woodpecker
Dendroica coronata (Townsend)	yellow-rumped warbler
Empidonax hammondii (Zantus)	Hammond's flycatcher
Empidonax oberholseri (Phillips)	dusky flycatcher
Empidonax wrightii (Baird)	gray flycatcher
Eromophila alpestris (Linnaeus)	horned lark
Euphagus cyanocephalus (Wagler)	Brewer's blackbird
Falco columbarius (Linnaeus)	pigeon hawk (merlin)
Falco mexicanus (Schlegel)	prairie falcon
Falco sparverius (Linnaeus)	sparrow hawk
Glaucidium gnoma (Wagler)	pygmy owl
Hylocichla guttata (Pallas)	hermit thrush
Iridoprocne bicolor (Vieillot)	tree swallow
Junco caniceps (Woodhouse)	gray-headed junco
Loxia curvirostra (Linnaeus)	red crossbill
Megaceryle alcyon (Linnaeus)	belted kingfisher
Molothrus ater (Boddaert)	brown-headed cowbird
Oporonis tolmiei (Townsend)	MacGillivray's warbler
Parus gambeli (Ridgway)	mountain chickadee

Table 35. (Continued)

Scientific Name	Common Name
Passerculus sandwichensis (Gmelin)	Savannah sparrow
Passerella iliaca (Merrem)	fox sparrow
Passerina amoena (Say)	lazuli bunting
Perdix perdix (Linnaeus)	gray partridge
Phalaenoptilus nuttallii (Audubon)	poor-will
Pheucticus melanocephalus (Swainson)	black-headed grosbeak
Pica pica (Linneaus)	black-billed magpie
Pipilo erythrophthalmus (Linnaeus)	rufous-sided towhee)
Piranga ludoviciana (Wilson)	western tanager
Pooecetes gramineus (Gmelin)	vesper sparrow
Psaltriparus minimum (Townsend)	common bushtit
Quila chrysaetos (Linnaeus)	golden eagle
Regulus calendula (Linnaeus)	ruby-crowned kinglet
Regulus satrapa (Lichtenstein)	golden-crowned kinglet
Salpinctes obsoletus (Say)	rock wren
Selasphorus platycercus (Swainson)	broad-tailed hummingbird
Sialia currucoides (Bechstein)	mountain bluebird
Sialia mexicana (Swainson)	western bluebird
Sitta candensis (Linnaeus)	red-breasted nuthatch
Sphyrapicus throideus (Cassin)	Williamson's sapsucker
Sphyrapicus varius (Linnaeus)	yellow-bellied sapsucker
Spinus pinus (Wilson)	pine siskin
Spizella breweri (Cassin)	Brewer's sparrow

Table 35. (Continued)

Scientific Name	Common Name
Spizella passerina (Bechstein)	chipping sparrow
Stelgidopteryx ruficollis (Bieillot)	rough-winged swallow
Sturnella neglecta (Audubon)	western meadowlark
Tachycineta thalassina (Swainson)	violet-green swallow
Troglodytes aedon (Vieillot)	house wren
Turdus migratorius (Linnaeus)	robin
Vermivora celata (Say)	orange-crowned warbler
Vireo gilvus (Vieillot)	warbling vireo
Wilsonia pusilla (Wilson)	Wilson's warbler
Zenaidura macroura (Linnaeus)	mourning dove
Zonotrichia leucophrus (Forster)	white-crowned sparrow

Table 36. Mammals Observed on the Cassia Evaluation Area (1979).

Scientific Name	Common Name
Canis latrans	coyote
Castor canadensis	beaver
Clethrionomys gapperi	Boreal redblack vole
Erethizon dorsatum	porcupine
Eutamias amoenus	yellow pine chipmunk
Eutamias dorsalis	cliff chipmunk
Dutamias minimus	least chipmunk
Felis concolor	mountain lion
Lepus californicus	blacktail jackrabbit
Lepus townsendi	whitetail jackrabbit
Marmota flaviventris	yellowbelly marmot
Microtus longicaudus	longtail vole
Microtus montanus	mountain vole
Mustela erminea	shorttail weasel
Mustela frenata	longtail weasel
Neotomea cinerea	bushtail woodrat
Odocoileus hemionus	mule deer
Perognathus longimembris	little pocket mouse
Perognathus parvus	Great Basin pocket mouse
Peromyscus maniculatus	deer mouse
Spermophilus beldingi	belding ground squirrel
Spermophilus lateralis	golden-mantled ground squirrel
Sylvilagus nuttallii	mountain cottontail
Taxidea taxus	badger
Thomomys talpoides	northern pocket gopher
Zapus princeps	western jumping mouse

Table 37. Reptiles Observed on the Cassia Evaluation Area (1979).

Scientific Name	Common Name
Charina bottae	Rubber boa
Crotalus viridus	Western rattlesnake
Doluber constrictor	Racer
Eumeces skaltorianus	Western skink
Masticophis taeniatus	Striped whipsnake
Phrynosoma douglasii	Short-horned lizard
Phrynosoma platyrhinos	Desert horned lizard
Pituophis melanoleucas	Gopher snake
Sceloporus graciosus	Sagebrush lizard
Sceloporus occidentalis	Western fence lizard
Thamnophis spp.	
Uta stansburiana	Side-blotched lizard